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A model of cumulative proton production in the process $pd \to ppn$

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Production of particles in reactions on nuclear targets in the kinematical region forbidden in the case of free proton target, i.e. cumulative region, is still a challenge to theoretical models. That is because the simplest impulse approximation fails to provide large enough cross sections for large momentum cumulative particles, even when Fermi motion is taken into account. This led to several possibilities ranging from the multiple rescattering and thermal mechanisms to the exotic scenarios of interaction with density fluctuations and multi-quark clusters. In this talk, the method of the generalized eikonal approximation based on the multiple scattering diagrams is discussed in the application to the backward proton production in exclusive $pd \to ppn$ reaction. The model includes one- and two-step rescattering diagrams with intermediate nucleon and $\Delta(1232)$ resonance. Thereby, the spin-isospin structure of the deuteron and the antisymmetry of the full reaction amplitude are carefully taken into account. Numerical implementation of the model is performed in the form of a Monte Carlo event generator. The model describes existing data on the spectra of backward protons at relativistic energies, including the JINR data for dp collisions at 3.33 GeV/c [1] and pd collisions at 8.6 GeV/c [2] quite well. Predictions for cumulative proton spectra in $pd \to ppn$ in the NICA SPD regime are provided.

[1] B. S. Aladashvili et al. (Warsaw-Dubna), Yad. Fiz. 27, 704 (1978).

[2] A. M. Baldin et al., "Cumulation of Light Nuclei,"(1977), JINR-P1-11168.

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